

ILLUSTRATIONS AND DESCRIPTIONS OF SOUTH AUSTRALIAN FUNGI

I. *AGARICUS* AND *CORTINARIUS* WITH SPECIAL REFERENCE TO ANTIBIOTIC SPECIES

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Plates i-iii.

SINCE the discovery of penicillin and its allies, numerous workers have shown that the production of substances antagonistic to the growth of micro-organisms is not limited to mould fungi alone, but seems to be a very widespread characteristic of many members of the plant kingdom. The substances active in producing such effects may be very diverse in constitution, and, in fact, the majority of them still await exact chemical identification.

In England, Wilkins and Harris (1944) have shown that extracts of the sporophores of many of the larger Basidiomycetes may be active against the representative bacteria, *Escherichia (Bacterium) coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa (pyocyanea)*, and of some seven hundred species tested by them during the seasons of 1942-3, about seventy proved to be strongly active, and about a hundred weakly so. In Victoria over two hundred species were examined by Mathieson (1946) who found about forty to be active against *Staph. aureus* and twenty to be active against both *Staph. aureus* and *Esch. coli*. In South Australia, Atkinson (1946) reported only five active species in over two hundred tested.

This paper has arisen from a consideration of the identification of some of the groups of the higher fungi which have been tested for antibiotic properties and have given positive results. Mathieson (1946) has indicated that the systematics of these groups leave much to be desired, and it is hoped that this paper will be the first of a series investigating some of the Australian representatives. In it a new variety of *Agaricus* and nine new species of *Cortinarius* are described along with one new name and notes on three other species. All the accompanying plates have been prepared from watercolours drawn by Miss Gwen D. Walsh of the South Australian Museum, and to whom our thanks are due.

The results of Wilkins and Harris (1944) and Mathieson (1946) suggest that the occurrence of antibiotic properties of the extracts of basidiomycete sporophores is not confined exclusively to certain groups, but rather seems to be

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scattered more or less indiscriminately through many of the genera. In South Australia workers at the Institute of Medical and Veterinary Science have reported many fewer positive results (Atkinson, 1946) and it has seemed that activity has been restricted to comparatively well-defined groups, notably the genera *Agaricus* L. ex Fr. and *Cortinarius* (Pers. ex Fr.) Gray. Nevertheless, it has been quite a striking feature that several species reported as active by Wilkins and Harris (1944) in England have been reported as inactive by Mathieson (1946) and Atkinson in Australia, e.g. *Agaricus arvensis* (Schaeff.) Fr. and *Polystictus versicolor* (L.) Fr., while a large number of the species reported as active by Mathieson (1946) in Victoria have been found to be inactive in South Australia by Atkinson and co-workers, e.g. *Cortinarius castanea-fulvus* Clel., *Trametes cinnabarina* (Jacq.) Fr., *Clitopilus subfrumentaceus* Clel. and *Mycena epipterygia* Scop., so that at present one is in quandary whether to explain such discrepancies as due to variations amongst strains of the one species of fungus, to the production of antibiotic substances being dependent upon locality and environment, to distinct species having been used but identified as the one species and so named, or to a reflection of minor differences between the techniques of the workers testing them and the strains of bacteria they have employed.

A recent paper by Atkinson (1946) has dealt with the properties of extracts of two of the fungi provisionally identified by one of us (J.B.C.) as *Cortinarius rotundisporus* Clel. et Cheel and *Psalliota xanthoderma* Genev. In the light of further examination of collected material it seems that each should be re-named.

In accordance with Ainsworth and Bisby (1943) we shall adopt the generic name *Agaricus* L. ex Fr. rather than *Psalliota* (Fr.) Quel. as used by Rea (1922) and Cleland (1934) in reference to the genus which includes the common field and horse mushrooms, since the former has been advocated by the British Mycological Society (1940). In this genus Wilkins and Harris (1944) found extracts of *A. arvensis* (Schaeff.) Fr. and two varieties of *A. xanthodermus* Genev. to be active. In Victoria, Mathieson (1946) has found both *A. arvensis* (Schaeff.) Fr. and *A. xanthodermus* Genev. to be inactive, while Atkinson has found the former to be inactive, while a fungus closely resembling the latter to be uniformly and consistently active against *Staph. aureus*, *Bact. typhosum*, the vole tubercle bacillus and *Mycobacterium phlei*.

Cleland (1934) believed that the fungus closely resembling the horse mushroom but showing yellow stains on bruising, and found by him in Australia, to be apparently identical with the Continental *A. xanthodermus* Genev. and so he recorded it accordingly. The yellow staining phenomenon of this mushroom is so characteristic, that in a genus such as *Agaricus* L. ex Fr. with some sixty temperate species, this property is sufficiently well marked to form the basis of the

species determination. Until recently it has been believed that the Southern Hemisphere species is identical with the northern type, but compared to this plant as figured by Ramsbottom (1945), the plant which we have been collecting is usually shorter and stouter in the stem, smaller in overall dimensions and of slightly different growth habit, coupled with the fact that numerous records are available of persons eating large numbers of this fungus without feeling the slightest ill effects in contrast to its European record. Therefore, we feel that possibly the South Australian plant may not be identical with the type description and so suggest segregating it as a new variety for which the name *Agaricus xanthodermus* var. *antibioticus* var. nov. is proposed. It is also pointed out that this new variety is closely related to *A. arvensis* var. *fragrans* Clel. and Cheel described and figured by Cleland and Cheel (1918) and which differs from it in possessing a decidedly fragrant smell, so that it indicates that the new variety is closely related to both *A. arvensis* (Schaeff.) Fr. and *A. xanthodermus* Genev.

Recently Wilkins (1947) has indicated that irregular positive results for *A. arvensis* (Schaeff.) Fr. previously reported by Wilkins and Harris (1944) are almost certainly due to mistaken identification of individuals of *A. xanthodermus* Genev. Furthermore, he suggests that the *Psalliota xanthoderma* of Atkinson (1946), the *Psalliota* sp. of Mathieson (1946) and the English collections of *A. xanthodermus* may be identical, but it seems doubtful at least whether the South Australian and the Victorian plants are sufficiently alike to be so. Below is a description of the new variety:

AGARICUS XANTHODERMUS VAR. ANTIBIOTICUS VAR. NOV.

Pileus at first 4 cm. in diameter with a flat top (4 cm.) and nearly vertical sides (2.2 cm. high), then to 6 cm., convex, whitish with a tendency to fibrillose scales, sometimes finely flocculose (in the watercolour covered with dirt so as to appear brownish), turning mustard-pickle colour when rubbed under the tap to remove the dirt. Closed with the veil. Veil rather double at the attachment to the stem, white turning yellow when rubbed, ring rather distant. Gills quite free, 7 mm. deep, at first livid pink (near Fern Drab, pl. xlv²), never fresh pink, then dingy purplish. Stem 4 to 5 cm. high, stout, equal above (1.5 to 2 cm.), conical below passing into the root, whitish with Deep Chrome (pl. iii) stains at base of stem, finely fibrillose, solid. Flesh turning yellow. Smell rather strong. Spores fuscous, rather variable in shape, broader at one end, 7.5 to $9 \times 5.5\mu$ some $5.5 \times 3.7\mu$. Near Adelaide, August, 1946. Tested at the Institute of Medical and Veterinary Science, Adelaide, over the last three years this species, or at least

²These Roman figures refer to the plates in Bidgway's Color Standards and Color Nomenclature, Washington, 1912.

this variety of it, has been consistently strongly antibiotic to *Staph. aureus*, *Eberthella typhosa*, the vole tubercle bacillus and *Mycobacterium phlei*. If this antibiotic quality does not pertain to the type species, we would apply the term *antibioticus* to this as a definite variety. [See Atkinson (1946) for properties of extracts.]

Varietas cum qualitatibus perantibioticis contra *Mycobacterium* sp. *Staphylococcus aureus* et *Eberthellam typhosam*.

CORTINARIUS.

The genus *Cortinarius* (Pers. ex Fr.) S. F. Gray is the largest genus of the Agaricales, having at least some four hundred recognized species, especially in the Northern Temperate zone. The genus is a very well-defined one, but according to Fries (1836-8) "although it is a great natural group, the species are so intimately related among themselves that to distinguish the separate ones is almost to be despaired of." In England at least two hundred are known, but for Australia Cooke (1892) lists only seven, while Cleland (1928) records fourteen and later (1934) some twenty-six, of which all but four are new, so that in all not more than about thirty to forty separate Australian collections have been named.

While the generic characters are so well-marked, there are so many closely related species giving a whole graded series from one extreme feature to another, that the taxonomy within the genus is extremely difficult, since it is so difficult to ascertain where one species ends and another begins. One therefore has to choose between either the tendency to recognize a few species exhibiting considerable variations or to recognize a larger number of species of reasonably constant morphology. It is difficult to say which is the wiser until we are able to assess the species concept within this genus upon a more natural basis and have some understanding of the effect of ecological factors upon morphological features and also some knowledge of the genetics of the group.

The genus was divided by Fries into some six sub-genera, a system which has remained intact with most present day authors. A key to these as used by Lange (1938) is as follows:

- I. *Phlegmacium*. Fleshy, generally large species with a more or less viscid cap and a dry stem.
 - (i.) *Seauri*. Stem with a distinct often marginate bulb.
 - (ii.) *Cliduchi-Elastici*. Stem club-shaped or cylindrical, without marginate bulb.
- II. *Myxaciium*. Both cap and stem more or less viscid.
 - (i.) *Colliniti*. Stem peronate, slimy. Spores pruniform, large ($>10\mu$).
 - (ii.) *Delibuti*. Stem merely viscid. Spores smaller ($<9\mu$).

- III. *Inoloma*. Cap and stem dry, generally squamulose or somewhat fibrillose. Stem stout.
- (i.) Pallido-violacei. Whole fruiting body whitish or flushed with lilac or bluish.
 - (ii.) Olivaceo-aurati. Cap and stem with some tinges of olive, yellow, ochre or red.
- IV. *Dermocybe*. Cap dry (not hygrophanous), subfibrillose or subsquamulose. Stem slender.
- (i.) Anomali. Gills olive, bluish or pallid.
 - (ii.) Nitidi. Gills brilliant yellow to deep blood red or liver brown.
- V. *Telamonia*. Expallent or hygrophanous. Stem peronate or annulate by remnants of universal veil.
- (i.) Carnosi. Rather fleshy species (only sub-hygrophanous) with a somewhat bulbous stem. Spores often rather large ($>9\mu$).
 - (ii.) Submembranacei. Slightly fleshy, hygrophanous species with a rather slender stem. Spores generally rather small ($<9\mu$).
- VI. *Hydrocybe*. Hygrophanous species with a glabrous or slightly fibrillose stem.
- (i.) Firmiores. Cap generally over 4 cm. broad, obtuse with incurved edge. Spores rarely ($<9\mu$).
 - (ii.) Tenuiores. Cap small (rarely over 4 cm. broad), often acute, straight-edged. Spores small ($<9\mu$).

Kauffman (1918) raises the subsection *Seauri* to the rank of a sub-genus, viz. *Bulbopodium*, and some authors have accepted this as a seventh sub-genus. The boundaries between these sub-genera are not always sharply defined and it becomes almost arbitrary at times into which of two such sub-genera one will place a species; hence their use is rather limited and of doubtful value, on an absolute basis, but for the sake of uniformity they have been included here. *Phlegmacium* and *Myxaciium* include those species with viscid pileus, *Inoloma* and *Dermocybe* those with innately silky to scaly pileus and *Telamonia* and *Hydrocybe* those with a hygrophanous pileus.

Since several Cortinariae have been found to yield extracts with antibiotic properties, it is important to open up the question of the taxonomic status of the Australian representatives. It is beyond the scope of this paper to attempt a complete revision except insofar as it is pertinent to the few species described here or to correct previously published inaccuracies.

It seems that those species listed by Cleland (1928 and 1935) as representatives of the sub-genus *Telamonia*, viz. *C. striatulus* Clel., *C. russeo-cinnamomeus* Clel., and *C. vinaceo-cinereus* Clel. would be more correctly considered under the sub-genus *Hydrocybe* while *C. fibrillosus* Clel. is probably a slender *Dermocybe*.

An additional record for this state is *C. austro-evernius* Clel. et Cheel as described by Cleland and Cheel (1918) from New South Wales, and this, too, appears to be a *Hydrocybe*, subsection *Tenuiores*.

The sub-genus *Dermocybe* is represented by a large number of species, the bulk of which are unnamed and undescribed. A wide variety of forms are found which grade closely from one to another, so that a whole range is met with which is very difficult to subdivide into species except in a few well-marked examples. Two closely related and well-marked species representative of this sub-genus are described below. Both are believed to be hitherto undescribed and so have been named *C. basirubescens* sp. nov. and *C. umbonatus* sp. nov. Both are characterized by tanny-brown, silky-fibrillose pilei, lighter ochraceous gills and strikingly pink tufts of mycelium at the base of the stem. The former is rare and is known only from a single locality from which specimens were found to be antibiotic, but the latter is more common in sclerophyll forest communities and has never shown activity from a large number of collections.

CORTINARIUS (DERMOCYBE) BASIRUBESCENS sp. nov.

Pileus small, 2 cm. to 4.5 cm. ($\frac{3}{4}$ – $1\frac{3}{4}$ in.) in diameter, convex, smooth, silky, dry, Cameo Brown (xxviii) to Liver Brown (xiv) with darker patches near the centre to Blackish Brown (xlv). Flesh moderately thick beneath the centre, attenuated rapidly towards the periphery, but without pronounced umbo, creamy. Gills adnate with a slight sinus, moderately crowded, in four tiers, Mikado Brown (xxix) to Ochraceous Tawny (xv). Stem relatively stout, creamy near Chamois (xxx), with remnants of the darker cortina forming an imperfect arachnoid ring, slightly swollen towards the base, 4–6 cm. ($1\frac{1}{2}$ – $2\frac{1}{2}$ in.) long and up to 1.25 cm. ($\frac{1}{2}$ in.) at base which sharply tapers to a tuft of crimson mycelium with the red colour tending to extend as a flush to almost half-way up the stipe. Spores light brown, smooth, mostly sub-globose to elongate-ellipsoidal, inequilateral, smallish, 9–12 μ long \times 8 μ wide. Smell absent. Subcaespitose in soil around the base of a Eucalypt stump. Mylor, June.

The crimson mycelium at the base of the stipe with the tendency for a red flush to extend along it marks the species as very characteristic. The stouter stem suggests a probable relation with *Inoloma*.

Pileus 2–4.5 cm., convexus, glaber, sericeus, siccus, "Cameo Brown" ad "Liver Brown," in centro "Blackish Brown." Caro in exteriorem partem attenuata. Lamellae subsinuato-adnatae, subconfertae, "Mikado Brown" ad "Ochraceous Tawny." Stipes suberassus, cremeus, 4–6 \times 1.25 cm., ad basem mycelio coccineo. Annulus imperfectus, arachnoideus. Sporae, 9–12 \times 8 micra. Plantae subcaespitosae.

CORTINARIUS (DERMOCYBE) UMBONATUS SP. NOV.

Plate iii, fig. 1.

Pileus 5-6 cm. (2-2½ in.) across, distinctly umbonate at first, but spreading to become almost plane, silky smooth, dry, an even tawny brown near Kaiser Brown (xiv) or Sanford Brown (ii) to Burnt Sienna (ii), finely striate. Flesh thick over disk, attenuated rapidly towards periphery. Gills in four tiers, sinuato-adenate, more or less irregular along the edges, lighter than the pileus, Ochraceous Tawny (xv) or Clay Colour (xxix). Stem central, smooth, pallid above, browner below with tints of pileus, more or less equal, 6-11 cm. long, 10-12 mm. in diameter, slightly swollen at the base, and occasionally with tufts of pinkish mycelium. Spores light yellow, subglobose, ovoid to ellipsoidal, inequilateral, exospore slightly rough, obliquely apiculate $6-10\mu \times 5-7.5\mu$. Solitary to caespitose in sclerophyll forest. May to July, National Park, Waterfall Gully, Stirling.

This is quite a common, handsome species with its dark tawny brown umbonate cap and pale stem. Extracts of sporophores have not given positive antibiotic reactions.

Pileus 5-6 cm., subumbonatus deinde subplanus, sericeus, glaber, siccus, tenuiter striatus, "Kaiser Brown" vel "Sanford Brown" ad "Burnt Sienna." Caro in centro crassa, in exteriorem partem attenuata. Lamellae sinuato-adenatae, "Ochraceous Tawny" vel "Clay Color." Stipes glaber, supra pallidus, infra subfulvus, 6-11 cm. \times 10-12 mm. Sporae. $6-10 \times 5.75$ micra.

CORTINARIUS (DERMOCYBE) OLEAGINUS SP. NOV.

Plate ii, fig. 4.

Pileus small to medium, 2-6 cm. (¾-2¼ in.), very convex at first becoming almost plane at maturity and then usually accompanied by radial splitting, colours variable showing a range from light greenish yellow through olive tints to almost greenish blue. The basal colour of the pileus is yellow near Cream Buff (xxx) or Honey Yellow (xxx) with applied fibrils of the *velum universale* of light blue to lilae rendering the pileus olivaceous near Eern Olive (xxx), Dark Olive Buff (xl), Artemesia Green (xlvii), Deep Grayish Olive (xlvi) to Pale Russian Blue (xlii). Flesh thin, yellow. Gills in four series, adnate to sinuato-adenate or decurrent by a tooth, light brown shades near Cinnamon Buff (xxix), Antimony Yellow (xv) to almost Ochraceous Tawny (xv) in old age. Stem slender to medium stout, up to 10 cm. long, attenuated slightly in either direction from 4 mm. to 12 mm., light creamy yellow with faint cinereous tints to strongly

developed lilac tints of the *velum universale*, and beset with scanty brown fibrillose remnants of the cortina. Spores rotund, yellow-brown, $7 \times 6\mu$. Solitary to subcaespitose. Waterfall Gully, Crafers, May, June.

This is quite a handsome species exhibiting an exceptionally wide range of variations in colour tones. It provides a striking example of a cortina in which the basal colour of the pileus is modified by the closely appressed *velum universale* of quite a different colour. *Cort. austro-evernius* Clel. et Cheel is another example of such a modification, and the resultant wide range in colours is due to different amounts of vestigial universal veil. It should therefore be stressed that these colours should be indicated in describing the species, as they are of great use in working a key to the species.

Pileus 2-6 cm., convexus, deinde subplanus, viridi-flavus ad viridi-caeruleum vel olivarium. Caro tenuis, flava. Lamellae adnatae ad sinuato-adnatas, "Cinnamon Buff," "Antimony Yellow" et "Ochraceous Tawny." Stipes tenuis ad subcrassum, ad 10 cm. \times 4-12 mm., cremeo-flavus cum colore veli universalis lilacino. Sporae globosae, 7×6 micra.

CORTINARIUS (TELAMONIA) VERONA-BRUNNEUS sp. nov.

Plate i, fig. 1.

Pileus small to medium, 3.5-5.0 cm. ($1\frac{1}{2}$ -2 in.), slightly convex to irregularly plane, slightly umbonate, smooth to subfibrillose, Mikado Brown to Verona Brown (xxix) with lighter radial striations. Flesh dingy-pallid, thin, hygrophaneous. Gills slightly sinuate, moderately close set, near Ochraceous Tawny (xv), 5 mm. deep. Stem 4.0-4.5 cm. long, moderately stout (5-8 mm.), equal to slightly attenuated below, and with a slight cavity terminating in a slightly bulbous base, pale above, tinted with Verona Brown (xxix) below where it is partially peronate by remnants of the universal veil. Spores yellow brown, oblique, $9 \times 5\mu$. Solitary. Waterfall Gully; May.

This species is typical of *Telamonia* section Carnosi with relatively larger stem and spores than is found in the section Submembranacei. The sub-genus is not represented by many species in Australia, and those previously described by Cleland (1928-1934) for *Telamonia* are better considered as *Inolomus*.

Pileus 3.5-5 cm., subconvexus ad planum, irregulariter, subumbonatus, glaber ad subfibrillosum, "Mikado Brown" ad "Verona Brown." Caro subfusco-pallida, tenuis, hygrophana. Lamellae subsinuatae, subconfertae, "Ochraceous Tawny." Stipes 4-4.5 cm. \times 5-8 mm., ad basem subbulbosus, supra pallidus, infra "Verona Brown" et subperonatus. Sporae, 9×5 micra.

CORTINARIUS (HYDROCYBE) CINNAMONEO-BADIUS sp. nov.

Plate ii, fig. 2.

Small plants. Pileus 1.5–2 cm., convex, subgibbous, expanding until almost plane with convex edge, hygrophanous, Verona Brown to Warm Sepia (xxix) or darker if moist, passing through Mikado Brown to Cinnamon to Orange Cinnamon (xxix), at first mealy with remnants of the veil, finally rather rugose with lacerated edge of cortina. Gills sinuate, moderately close, near Mikado Brown (xxix). Stem slender, 2–2.5 cm., whitish and clothed with whitish fibrillose remnants of the universal veil, flesh brownish with slight cavity. Spores subglobose to ellipsoidal, 9 to 12 × 6 to 9 μ . Gregarious. Stonyfell, near Adelaide; July.

Pileus 1.5–2 cm., convexus, subgibbosus, deinde subplanus, hygrophanus, "Verona-Brown," "Warm Sepia," deinde exsiccatus "Mikado Brown" vel cinnamoneus. Lamellae sinuatae, subconfertae, "Mikado Brown." Stipes tenuis, 2–2.5 cm., albidus. Velum albidum. Sporae subglobosae vel ellipsoideae, 9–12 × 6–9 miera.

CORTINARIUS (HYDROCYBE) AUSTRO-EVERNIUS Clel. et. Cheel.

Plate i, fig. 2.

Plants small, slender. Pileus 3–3.5 cm. diameter, at first hemispherical becoming plano-convex, frequently slightly umbonate, becoming centrally depressed at maturity, moist to viscid under damp conditions, subfibrillose, near Deep Quaker Drab (li) to Pale Mouse Gray (li) with yellowish tints. The basal colour of the pileus is yellow, upon which is superimposed the blue tones of the *velum universale*, giving a range of shades from pale yellows through drab grays to light blues. Gills sinuate to adnate, generally close, 5 mm. deep, near Cinnamon Buff (xxxix). Stem 5–7 cm. long, rather flexuous, attenuated downwards but rather bulbous below, with tints of the cap becoming yellowish below, solid. Flesh pallid white becoming yellowish. Spores rotund, 7.5, 5.6–7.5 μ , yellow-brown. Subcaespitose. Waterfall Gully; May.

CORTINARIUS (PILEGMACIUM) IANTHINUS sp. nov.

Plate iii, fig. 3.

Plants medium to large. Pileus up to 9 cm. (3½ in.) in diameter, at first hemispherical becoming almost plane, rather irregular, smooth, moist, pallid to lavender or violet near Plumbeo Blue (xlili) to Pale Aniline Lilae or Aniline Lilae (xxxv) or Bluish Lavender (xxxvi), striate with the remnants of the universal veil which is russet near Morocco Red (ii) and may give the pileus reddish-purplish tonings near Russet Vinaceous (xxxix) or Vinaceous Brown

(xxxix). Flesh thick, white, sometimes exposed by radial cracks. Gills close set to coarse, multiseriate, sinuato-adsnate or decurrent by a tooth, at first with faint lilac tints, becoming cinnamon to browner with age near Light Ochraceous Salmon (xv), Cinnamon (xxix) to Mikado Brown or Tawny (xv). Stem stout and long, to 11 cm. \times 20 mm., slightly broader at the base, violet concoloured with the basal colour of the pileus, fibrillose with remnants of the universal veil, near Mahogany Red (ii). Spores yellow brown, obliquely apiculate, $11-13 \times 8\mu$. Solitary to subcaespitose. Morialta, Myponga, Waterfall Gully; May, June, July.

Pileus ad 9 cm., primum hemisphericus deinde planus, glaber, humidus, ianthinus. Caro crassa, albida. Lamellae sinuato-adsnatae, primum sublilacinae, deinde cinnamoneae ad fuscas. Stipes crassus, 11 cm. \times 2 cm., ianthinus. Velum universale "Morocco Red" vel "Mahogany Red." Sporae $11-13 \times 8$ micra.

CORTINARIUS (PHLEGMACIUM) VIOLACEO-HINNULEUS sp. nov.

Plate ii, fig. 3.

Pileus 5-6 cm. ($1\frac{1}{2}$ - $2\frac{1}{2}$ in.), convex becoming plane to upturned, often more or less gibbous, margin wavy with a tendency to radial splitting, surface sticky when moist, more or less matt, chamois-coloured near Avellaneous (xi) to as dark as Saccardo's Umber (xxix) near umbo, but mostly Snuff Brown (xxix), faintly striate. Gills multiseriate, sinuato-adsnate to decurrent by a tooth, usually close set, 4 mm. deep, light brown near Clay Colour (xxix) or Buckthorn Brown (xv). Stem slender, 5-7 cm. long (2-3 in.) and 5-6 mm. but occasionally up to 10 mm. thick, slightly broader at the base, white with pronounced lavender to lilac tints near Endive Blue (xlili) or Dark Dull Bluish Violet (xxiv) to Antimony Yellow (xv). Spores obliquely ellipsoid, $9\mu \times 5.2-6.2\mu$. In stringybark forest, Waterfall Gully; May.

The species name is derived from the violet stem and the chamois or fawn coloured pileus (hinnuleus L. fawn).

Pileus 5-6 cm., convexus, deinde planus ad concavum, subgibbosus, viscidus, "Avellaneous," "Saccardo's Umber," vel "Snuff Brown." Lamellae sinuato-adsnatae vel subdecurrentes, "Clay Colour" vel "Buckthorn Brown." Stipes subtenuis, 5-7 cm. \times 5-6-10 mm., pallidus cum coloribus violaceis. Sporae ellipsoideae, $9 \times 5.2-6.2$ micra.

CORTINARIUS (PHLEGMACIUM) BASIBULBOSUS sp. nov.

Plate i, fig. 2.

Plants medium to large. Pileus 4.5 to 11 cm. ($1\frac{3}{4}$ - $4\frac{1}{4}$ in.), irregularly convex becoming more or less plane, smooth, somewhat sticky when moist, shining when dry to subfibrillose, near Tawny (xv). Flesh pallid tinted to tawny, somewhat semi-translucent in parts. Gills sinuate, somewhat ventricose, moderately close near Ochraceous Tawny (xv), to 1 cm. deep. Stem stout, 2.5 to 5 cm. long,

15 to 25 mm, broad with distinct marginate bulb 2–4 cm. at widest, silky fibrillose to striate with cortinal remnants, pallid with tawny tints, solid. Spores $7.5\mu \times 5\mu$, yellow brown, ellipsoidal, rather small, $7.5 \times 5\mu$. In Eucalypt forest, Crafers, May.

Both this species and the next are representatives of the section *Scauri* of sub-genus *Phlegmacium*. Some authors (e.g. Kauffman, 1918) have raised this section to sub-generic rank under the name of *Bulbopodium*, but we prefer to follow Lange (1938) and merge them with other closely related species under *Phlegmacium*.

Pileus 4.5–11 cm., convexus irregulariter, deinde planus, glaber, subviscidus, exsiccatus nitidus ad subfibrillosus. Caro pallida. Lamellae sinuatae, subventricosae, subconfertae, ochraceo-fulvae. Stipes crassus, 2.5–5 cm. \times 15–25 mm., marginato bulbo (2–4 cm.), sericeo-fibrillosus vel striatus, pallidus cum colore fulvo. Sporae 7.5×5 micra.

CORTINARIUS (PHLEGMACIUM) LAVENDOCAERULEUS sp. nov.

Plate ii, fig. 1.

Medium sized plants. Pileus 4–5 cm. ($1\frac{1}{2}$ –2 in.), at first almost hemispherical, later convex and more irregular, surface dull, viscid when moist, with basal brown colour of pileus tending to be modified by the closely appressed whitish and slightly lavender tinted universal veil, Iron Gray (li) to Drab or Hair Brown (xlvi). Flesh bluish white. Gills narrow, close set, adnate, Grayish Olive (xlvi) with bluish tints becoming browner with age. Stem stout, 4 cm. \times 18 mm. broad, bulbous below to 25 mm., Pale Forget-me-not Blue (xxi), fibrillose with remnants of cortina and universal veil. Spores obliquely ellipsoidal, yellow brown in mass, 9–11 sometimes $12.5 \times 6.7\mu$. Densely caespitose. Aldgate; April.

This is also a representative of the section *Scauri* of sub-genus *Phlegmacium*.

Pileus 4–5 cm., primum subhemisphericus, deinde convexus et irregularis, non-nitidus, viscidus, "Iron Gray," "Drab" vel "Hair Brown." Velum universale sublavendulense. Caro lavendulense pallida. Lamellae adnatae, angustae, confertae, "Grayish Olive" cum coloribus lavendulensibus. Stipes crassus, 4 cm. \times 18 mm., ad basem bulbosus, fibrillosus, "Pale Forget-me-not Blue." Sporae 9–11–12.5 \times 6–7 micra. Plantae caespitosae.

NOTES ON MEMBERS OF THE GENUS *CORTINARIUS*.

Cortinarius rotundisporus Clel. et Cheel. A coloured illustration of this fungus appears in Cleland and Cheel (1918) as does also *Cort. austro-evernius* Clel. et Cheel and typical material of the two may be readily compared and contrasted in this plate. *Cort. rotundisporus* Clel. et Cheel is a shorter, stouter

plant in which the blue colours are well developed, but *Cort. austro-evernius* is taller and more slender with basal colours of yellow to buff overlaid with blue tints from closely appressed remnants of the *velum universale*. Both have been found to possess antibiotic properties, but while the former has been tested from only a few collections, the latter has been found in relatively larger amounts, and it is this plant which has been studied by Atkinson (1946) and erroneously identified as *Cort. rotundisporus* Clel. et Cheel. Plate i, fig. 3 (S.A. Mus. Watercolour, No. 92) illustrates plants under drier growing conditions when the blue tints are not so well developed and is thus somewhat atypical.

Cortinarius albidus Clel. This representative of *Myzaceum* has been described by Cleland (1933,1934) under the name above, but it has been found to be untenable since the same specific name has been used for a Friesian species, *vide* Lange (1938). Therefore, we propose that the Australian material be referred under the new name *Cortinarius austro-albidus* *nom. nov.*

Cortinarius sanguineus (Wolf.) Fr. Within the sub-genus *Dermocybe* there are recognized in Europe three closely related bright red species, viz., *Cort. sanguineus* (Wolf.) Fr., *Cort. cinnabarinus* Fr. and *Cort. anthracinus* Fr., of which only the first named is recorded from South Australia by Cleland (1934) and the first two from Victoria by Willis (1941). There seems to be a whole range of these scarlet species, and as a first step towards the clarification of the position of valid species, we have included a coloured illustration of typical material of *Cort. sanguineus* (Wolf.) Fr. in plate iii, fig. 4 (S.A. Mus. Watercolour, No. 97).

SUMMARY.

An investigation has been made upon the taxonomy of higher fungi exhibiting antibiotic properties from South Australian collections. A new variety of *Agaricus* L. ex Fr. and nine new species of *Cortinarius* (Pers. ex Fr.) S. F. Gray have been described as well as one new name and notes on four other Cortinarius. Antibiotic activity has been recorded for extracts of sporophores of *Agaricus xanthodermus* var. *antibioticus* var. *nov.*, *Cortinarius austro-evernius* Clel. et Cheel, *C. rotundisporus* Clel. et Cheel, *C. oleaginus* sp. *nov.* and *C. basirubescens* sp. *nov.* A rearrangement of certain species of Cortinarius into their respective sub-genera has been made, especially with respect to sub-genera *Telamonia* and *Hydrocybe*.

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EXPLANATION OF PLATES.

Plate i.

- Fig. 1. *Cortinarius (Telamonia) verona-brunneus* sp. nov.
Fig. 2. *Cortinarius (Phlegmacium) basibulbosus* sp. nov.
Fig. 3. *Cortinarius (Phlegmacium) rotundisporus* Clel. et Cheel.
Fig. 4. *Agaricus xanthodermus* var. *antibioticus* var. nov.

Plate ii.

- Fig. 1. *Cortinarius (Phlegmacium) lavenderoceruleus* sp. nov.
Fig. 2. *Cortinarius (Hydrocybe) austro-evernius* Clel. et Cheel.
Fig. 3. *Cortinarius (Phlegmacium) violaceo-hinnulcus* sp. nov.
Fig. 4. *Cortinarius (Dermocybe) oleaginus* sp. nov.

Plate iii.

- Fig. 1. *Cortinarius (Dermocybe) umbonatus* sp. nov.
Fig. 2. *Cortinarius (Hydrocybe) cinnamonco-badius* sp. nov.
Fig. 3. *Cortinarius (Phlegmacium) ianthinus* sp. nov.
Fig. 4. *Cortinarius (Dermocybe) sanguineus* (Wolf.) Fr.